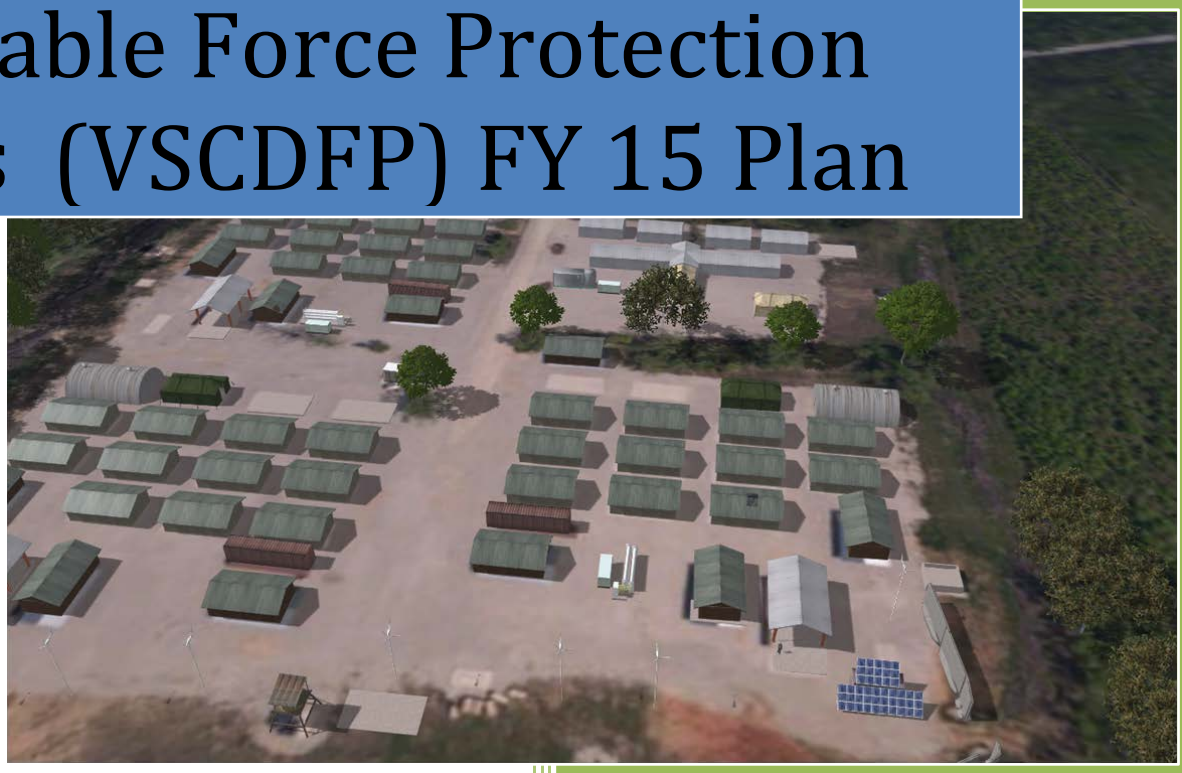
30 July 2014

Virtual Simulation Capability for Deployable Force Protection Analysis (VSCDFP) FY 15 Plan



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1. Background

Because of the multiple efforts across DOD, the Maneuver Support Battle Laboratory proposed and the DFP community funded, establishment of the Virtual Simulation Capability for Deployable Force Protection Analysis (VSCDFP) tool set at Ft. Leonard Wood Missouri. This toolset, a partnership with the Night Vision Electronic Sensors Directorate (NVESD), and the Army Research Laboratory– STTC has integrated multiple simulation tools into a common environment to examine the operational relevance and "goodness" of multiple sensing modalities, software engines and Common Operation Picture systems in a complex threat environment. This tool set can be used to do comparative analysis on system attributes, and provide insights into Tactics, Techniques and Procedures for DFP lines of effort and other DoD and Army related efforts.

2. FY 14 Overview:

The first specific task completed in FY 14 for this project was to setup and test the initial simulations infrastructure for the tool. This activity was started in November of 2013 and preceded through April of 2014. Activities included incorporation of the setup and integrating software packages (Night Vision Tool Kit and OneSAF) into the physical architecture, integration of the C2 system and layout of the physical infrastructure.

Following the infrastructure setup and testing the VSCDFP team, comprised of analysts from MSBL, software engineers from NVESD and ARL-STTC and MSBL study coordinators, began planning with the lead for the Integrated Sensor Architecture line of effort a study to review the operational effectiveness of an implementation of ISA is a small base scenario.

As the first event utilizing the VSCDFP simulation tool we conducted an experiment at Fort Leonard Wood, MO with six active duty participants (two Army officers and four non-commissioned officers (NCOs)) that tested the representative capabilities of the ISA in a virtual environment. This experiment focused on how ISA like architecture impacts a Base Defense Operations Center (BDOC) commander's response to base camp threats. Using Multi-Attribute Decision Making (MADM), experiment results showed that ISA like architecture allowed for an overall 60.7% increase in military utility when compared against BDOC operations when ISA like architecture is not available. When virtual ISA was enabled, the overall time that the participants used the radio was reduced by 27.5%, which could lead to lower bandwidth requirement. The virtual representation of ISA has a tangible benefit to the BDOC commander in reducing the time to act on a threat, regaining situational awareness after a sensor fails, increasing one's ability to take on more work, and boosting confidence in defeating a threat.

This experiment event validated not only the utility of a Virtual Simulation environment to do early evaluations of solutions for the DFP program, but also significantly assisted the ISA project in their effort toward transition of this technology to a Program Manager.

3. Planned FY 15 activities

As we move the VSCDFP forward into FY 15 we have plans for 4 specific analytic events. Those events are a use of the VSCDFP tool set for the NVESD, a second iteration of ISA studies, a evaluation of the HUMOD and Sniper Detect capability and an event(s) directly in support of the Technology Enabled Capability Demonstration 1a – Force Protection Basing Project Manager

Task 1:

In June of 2014 Night Vision Electronics Sensor Directorate (NVESD) approached the Maneuver Support Battle Lab (MSBL) to conduct a follow-on analytic event to an FY 13 event to evaluate an aerial mounted sensor platform to detect Improvised Explosive Devices and its use in Route Clearance missions.

Problem Statement

Route Clearance Patrols (RCP) are currently equipped with Puma Small Unmanned Aircraft Systems (SUAS) outfitted with a baseline two-axis steerable “Infini-spin” electro-optic/infrared (EO/IR) sensor payload. The current sensor payload (i.e., standard PUMA sensor) provides good situational awareness, but is not optimized for the detection of emplaced explosive threats such as IEDs.

Objectives

Study objectives are derived from the project charter as follows:

- Determine if adding the Enhanced Puma Roadrunner Payload (EPRP) enhanced sensor system to the Puma SUAS will be beneficial for Soldiers executing RCP mission sets.
- Develop the RCP EPRP Concept of Operations (CONOPS).
- Identify requirements for an EPRP sensor payload to support RCP missions.
- Determine if adding imagery from other sources and intelligence updates results in modification to the operational usage of the EPRP and if the operational clearance rates improve.

The FY 13 event was conducted using a similar simulation architecture to the VSCDFP tool set and the current architecture and scenario’s for Deployable Force Protection support this “Route Clearance” scenario activity. The first portion of this activity is scheduled to take place between 18 and 29 Aug 2014 with the second portion between 20 and 31 Oct 2014. The study will involve from 8 to 10 Senior NCO’s and Company Grade officers, technicians from NVESD and the MSBL staff. Final report from this event will be provided to the DFP Threat Detection Technologies LOE Lead, Mr. Joe Brooks as well as the sponsoring agency, NVESD.

Task 2:

Beginning in October 2014 planning for the second Integrated Sensor Architecture analysis event will begin. This event, will examine an upgrade to the initial VSCDFP architecture with additional ISA capability sets, an upgrade of the simulation software backbone to OneSAF ver. 7 and inclusion of the EASEE software package from ARL-STTC.

The overall goal of this event is to examine and increase Soldier's situational awareness Current capabilities of sensors, networks and receivers do not provide operators and decision-makers with the ability to rapidly and effectively discover and use sensors as significant force multipliers across the warfighting functions* and across unified land operations**

Hypotheses for this event are:

Hypothesis 1: Introducing the ability to rapidly and dynamically discover sensor systems (using ISA) will directly:

- Reduce response times
- Reduce decision-making time

Hypothesis 2: Dynamic Management of sensor systems (using ISA) will:

- Analytic issues for this second ISA event are:
- Reduce troop to task ratios

Measures / Elements of Analysis are:

- Are there significant differences in response times?
- What effect does Dynamic Discoverability and Management of ISA have on TTPs that were executed in base case?
- What is the troop to task impact?
- Under what conditions were sensors assets tasked by someone other than the sensor operator? Did this affect the operators ability to complete his/her mission responsibilities? How was the authority to control a sensor passed from the normal unit operator to an external controller/operator (e.g., override, token-passing, etc)? What level of decision(s) is the operator authorized to make wrt the sensor(s)? Does (s)he simply follow a checklist or does (s)he have autonomy with regard to Sensor use and control/tasking?
- What were the operational effects (In terms of combat effectiveness) of the dynamic re-tasking of sensors?
- What is the overall impact on commander's ability to execute his/her mission? Expect both positive and negative impacts. Positive – increasing SA will allow commanders to make faster, more informed decisions. Potential negative impact, commander's intended actions second guessed by higher authority (with same SA).

In addition this event will be utilizing a "non-DFP" tactical scenario that will significantly expand the area of operations of the unit replicated in the simulation.

Task 3:

The third study planned for FY 15 will be in support of the DFP Threat Detection Technologies LOA, specifically in support of the Human and Man-made Object detection system along with the Joint Counter Sniper Detect/Dazzle systems, and will be based on a extra small base scenario. The focus of the study will be to determine the operational effectiveness of the Human and Man-made Object detection system and Joint Counter Sniper Detect/Dazzle system and its ability to provide enhanced Situational Awareness to the unit commander.

The VSCDFP staff started coordination for this event in the middle of July 2014 with Mr. Ed Guckian and Ms. Melissa Sanders. Initial planning will occur in Aug and Sep of 14 with final planning for this event occurring in 1st Qtr 15. Tentative date for this study is the final two weeks of Feb 15.

Task 4:

The fourth event, or set of events, utilizing the VSCDFP toolset will be conducted in support of the Technology Enabled Capability Demonstration 4a – Force Protection Basing. At this time the entire scope of the event is to be determined, however the VSCDFP staff and the TeCD 4a program managers, Ms. Pam Kinnebrew and Mr. Joe Brooks have stated a significant interest in use of the virtual prototyping capability of the VSCDFP tool set to understand the operational implications of the technologies already selected as part of the TeCD. Initial planning for the TeCD will occur in the first of second week of Aug 14. At the completion of that planning effort the outline for use of the VSCDFP toolset will be more clearly understood.

Supporting Activities

Infrastructure upgrades:

In order to better support the VSCDFP architecture the MSBL will be upgrading the facility housing the tools with addition of HVAC and Electrical service. This is anticipated to take 30 days and is planned to occur in Sept 2014.

Simulation development and integration:

Implement sensor COP with RAPTOR X

The process of learning how to effectively use the RaptorX as a sensor COP in the VBDOC will increase our familiarity with the capabilities of our infrastructure, while enhancing our ability to bring in new sensor models and capabilities into our experiments. It will also inform future experiments by giving us insight and experience into the various ways in which sensor information can be communicated to the sensor operator and commander.

Implement Simulation Logger software

The process of integrating and experimenting with simulation logging software for both data and simulation traffic provides us the capability of additional, automated data sources for experimentation which supplement data from human observers. The data logged in such a way can be processed for analysis, and the recording and subsequent playback of simulation traffic facilitates after-action review (AAR) of experimental runs. Simulation playback may also be useful as an integral part of an event, as a possible way to implement realistic patterns of behavior for ancillary actors or "clutter" during a simulation event.

Implement JEMS software

The process of integrating JEMS software into the VBDOC provides us a way to interface with additional command and control (C2) systems. In the short term, this would allow us to make use of current common operating picture (COP) solutions such as CPOF in our experiments. In the future, it

could provide capability to integrate with real-world C2 devices (at CBITEC or elsewhere) in support of live training or experimentation.

Key Personnel:

The program management oversight for this effort will continue with the Maneuver Support Battle Lab in coordination with the Night Vision labs staff, ARL-STTC staff, and other partners. We will provide a quarterly update to the DFP S&T program manager and DFP SSC (as required) on systems / technologies evaluated, who the evaluations were conducted for, upcoming evaluations and status of funds obligation / disbursement.

POC's for the management of this Project are:

Primary:

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Facilities / Equipment:

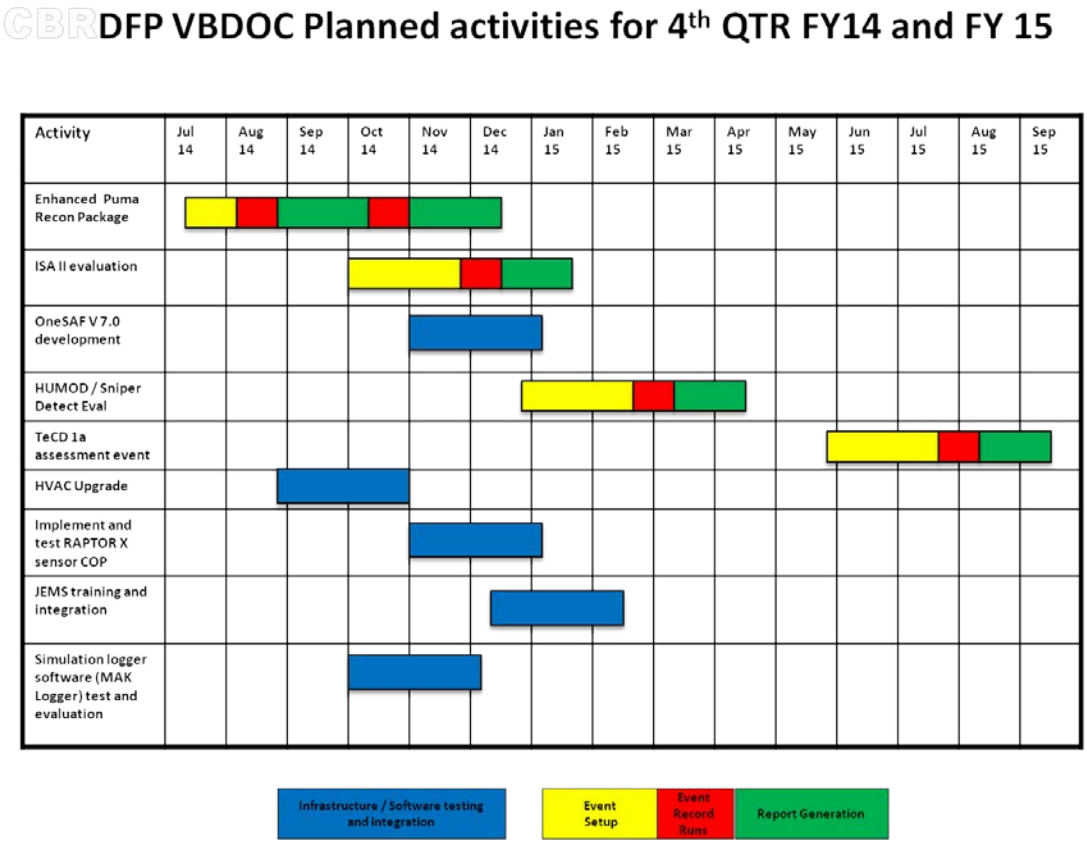
U.S. Army Maneuver Support Battle Laboratory (lead)

CERDEC Night Vision Electronic Sensors Directorate

U.S. Army Corps of Engineers Research and Development Center

Army Research Laboratory – STTC

Schedule:



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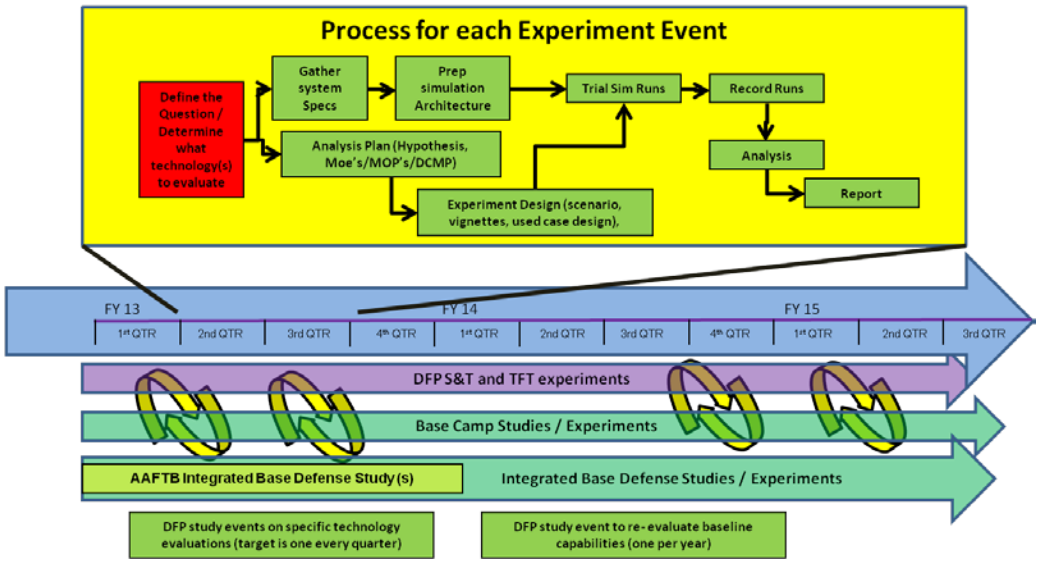
The diagram below is the process that the VSCDFP team continues to use in support of Deployable Force Protection Lines of Effort.



Cost / Functions Breakdown:

FY	Category	Labor (GOVT) (43%)	Labor (Cont) (57%)	Travel	Facility	Materials (software)	Equipment	**Total**
15	6.2/6.3	0	425K	25K	0	50K	50K	
Total		0K	425K	25K	0	50K	50K	**550K**

Cost / Function Summary.

MSBL

Functions: Setup, Maintenance and Operation of the Virtual Simulations Environment, plan and conduct the events and provide assessment results to customer

- System Administration & Analysis (0K, MSBL in-house function)
- Operations Research Analysis (0K, MSBL in-house function)

NVESD

Functions: Maintain and update the software in the Virtual Simulations Environment

- Software Engineering (305K)

ARL- STTC

Functions: Maintain and update the software in the Virtual Simulations Environment

- Software Engineering (120K)